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Jawaharlal Nehru

“Step Out From the Old to the New”

IS 3347-4-2 (1982): Dimensions for Porcelain Transformer Bushings for Use in Lightly Polluted Atmospheres - Part IV : 24 kV Bushings, Section 2: Metal Parts [ETD 6: Electrical Insulators and Accessories]

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Satyanaaranay Gangaram Pitroda

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Bhartṛhari—Nītiśatakam

“Knowledge is such a treasure which cannot be stolen”



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(Reaffirmed 1999)

Indian Standard

REAFFIRMED

APR2004

DIMENSIONS FOR

PORCELAIN TRANSFORMER BUSHINGS FOR
USE IN NORMAL AND LIGHTLY POLLUTED
ATMOSPHERES

PART IV 24 kV BUSHINGS

Section 2 Metal Parts

(First Revision)

Third Reprint APRIL 2002
(Incorporating Amendment No. 1)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 8

July 1983

Indian Standard

DIMENSIONS FOR PORCELAIN TRANSFORMER BUSHINGS FOR USE IN NORMAL AND LIGHTLY POLLUTED ATMOSPHERES

PART IV 24 kV BUSHINGS

Section 2 Metal Parts

(First Revision)

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(*Continued on page 2*)

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AMENDMENT NO 1 JULY 1987

TO

**IS : 3347 (Part IV/Sec 2)-1982 DIMENSIONS FOR
PORCELAIN TRANSFORMER BUSHINGS FOR USE IN
NORMAL AND LIGHTLY POLLUTED ATMOSPHERES**

PART IV 24 KV BUSHINGS

Section 2 Metal Parts

(First Revision)

(Page 29, Fig. 29) — Substitute the following for the existing figure:

(ETDG 3)

AMENDMENT NO. 2 FEBRUARY 1989
TO
IS : 3347 (Part 4/Sec 2) - 1982 DIMENSIONS FOR
PORCELAIN TRANSFORMER BUSHINGS FOR USE
IN NORMAL AND LIGHTLY POLLUTED
ATMOSPHERES

PART 4 24 kV BUSHINGS

Section 2 Metal Parts

(First Revision)

(First cover, pages 1 and 3, title) — Substitute the following for the existing title:

'Indian Standard'

**DIMENSIONS FOR PORCELAIN TRANSFORMER
BUSHINGS FOR USE IN LIGHTLY POLLUTED
ATMOSPHERES**

PART 4 24 kV BUSHINGS

Section 2 Metal Parts

(First Revision)'

(Page 5, clause 1.1, third line) — Delete the words 'normal and'.

(ETDC 3)

AMENDMENT NO. 3 APRIL 1994
TO
IS 3347 (Part 4/Sec 2) : 1982 DIMENSIONS FOR
PORCELAIN TRANSFORMER BUSHINGS FOR USE IN
LIGHTLY POLLUTED ATMOSPHERES

PART 4 24 KV BUSHINGS

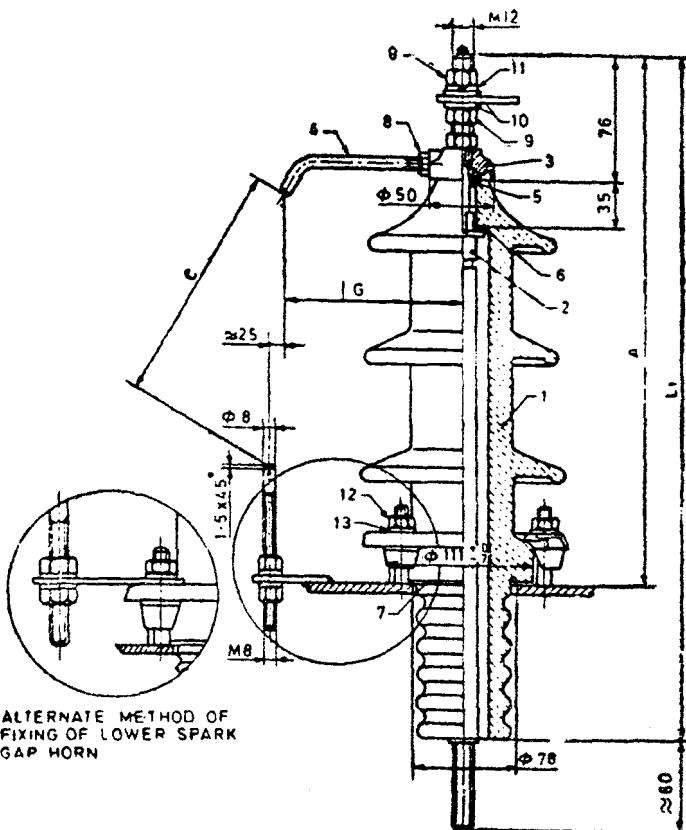
Section 2 Metal Parts

(*First Revision*)

(*Page 11, Fig. 1*) — Substitute 'R 2.5 ± 0.1' for 'R 3.5 ± 0.1' for dimensions of locking pins.

(ETD 06)

Reprography Unit, BIS, New Delhi, India



BUSHING RATING kV/A	A	C	G	L ₁
24/250	385	155	150	461

PARTS NOMENCLATURE

- | | |
|---------------------------------------|-------------------|
| 1. Insulator | 8. Hexagonal nut |
| 2. Stem | 9. Hexagonal nut |
| 3. Cap | 10. Plain washer |
| 4. Upper spark gap horn | 11. Spring washer |
| 5. Sealing washer for stem | 12. Hexagonal nut |
| 6. Separator | 13. Plain washer |
| 7. Sealing washer for general purpose | |

NOTE 1 — Clamping arrangement of bushings shall be according to IS : 4257 (Part 1)-1981 'Dimension for clamping arrangement for porcelain transformer bushing: Part 1 For 12 kV to 36 kV bushings (*first revision*).'

NOTE 2 — Alternate arrangement for fixing of lower spark gap horn may be used.

All dimensions in millimetres.

FIG. 29 BUSHING ASSEMBLY (FOR 24 kV/250 A RATING)

0.7 The dimensions of bushings for other voltages are covered by the following parts of this standard :

Part I Up to and including 1 kV bushings

 Section 1 Porcelain parts

 Section 2 Metal parts

Part II 3·6 kV bushings

 Section 1 Porcelain parts

 Section 2 Metal parts

Part III 12 and 17·5 kV bushings

 Section 1 Porcelain parts

 Section 2 Metal parts

Part V 36 kV bushings

 Section 1 Porcelain parts

 Section 2 Metal parts

Part VI 72·5 kV bushings

 Section 1 Porcelain parts

 Section 2 Metal parts

Part VII 123 kV bushings

 Section 1 Porcelain parts

 Section 2 Metal parts

0.8 The dimensions of porcelain transformer bushings for use in heavily polluted atmosphere are covered by the series of IS : 8603*. The metal parts covered by this section may be used for bushings covered by IS : 8603*.

0.9 In the preparation of this standard considerable assistance has been derived from the following DIN standards issued by the Deutscher Normenausschuss:

DIN 42531 (1968) Indoor and outdoor transformer bushings, insulation class 10 to 30 kV, 250 A

DIN 42532 (1969) Indoor and outdoor transformer bushings, insulation class 10 to 30 kV, 630 A

DIN 42533 (1969) Indoor and outdoor transformer bushings, insulation class 10 to 30 kV, 1 000 to 3 150 A

0.10 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance

*Dimensions for porcelain transformer bushings for use in heavily polluted atmospheres.

with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part IV/Sec 2) lays down the dimensions and materials of metal parts and accessories of bushings of 24 kV used with transformers for use in normal and lightly polluted atmospheres.

2. MATERIAL

2.1 The material of various parts shall conform to the relevant Indian Standards specified below:

<i>Metal Part or Accessory</i>	<i>For Bushing with Copper Stem</i>	<i>For Bushing with Aluminium Stem</i>
Hexagonal nut (for stem)	Material brass, screw threads conforming to 2.2 of IS : 1364-1967† and IS : 3138-1966‡ with a minimum tensile strength of 300 N/mm ²	Material aluminium alloy, screw threads conforming to 2.2 of IS : 1364-1967† and IS : 3138-1966‡ with the following properties: a) Electrical conductivity at 20°C Min 43 percent IACS (25 Sm/mm ²) b) Tensile strength, Min 300 N/mm ² c) Brinell hardness 5/250 Min 100 HB

*Rules for rounding off numerical values (revised).

†Specification for precision and semi-precision hexagon bolts, screws, nuts and lock nuts (diameter range 6 to 39 mm) (first revision).

‡Specification for hexagonal bolts and nuts (M 42 to M 150).

Metal Part or Accessory	For Bushing with Copper Stem	For Bushing with Aluminium Stem
Stem (see Fig. 1, 2 and 3)	For 250 A rated bushings brass to grade 3 of IS : 292-1961* or IS : 3488-1966† or IS : 319-1974‡. For 630, 1 000, 2 000, 3 150 A rated bushings high conductivity copper to ETP grade of IS : 191-1967§ and properties to IS : 613-1964 .	Aluminium alloy with the following properties :
Cap (see Fig. 4, 5 and 6)	Brass to grade 3 of IS : 292-1961* or to IS : 3488-1966†	a) Electrical conductivity at 20°C <i>Min</i> 43 percent IACS (25 Sm/mm ²) b) Tensile strength <i>Min</i> 300 N/mm ² c) Brinell hardness 5/250 <i>Min</i> 100 HB
Upper and lower spark-gap horn (see Fig. 7, 8, 9 and 10)	Cold drawn bright steel bar to IS : 9550-1980**	Aluminium alloy to 4 600 M designation of IS : 617-1975¶ or any other suitable aluminium alloy
Spark-gap horn carrier (see Fig. 11)	Brass to grade 3 of IS : 292-1961* or to IS : 3488-1966†	Cold drawn bright steel bar to IS : 9550-1980**
Sealing washer for stem (see Fig. 12, 13 and 14)	Oil resistant nitrile rubber made from vulcanized butadiene/acrylonitrile rubber compound having a hardness of 65 to 70 IRHD	Aluminium alloy to 4 600 M designation of IS : 617-1975¶ or any other suitable aluminium alloy
		Oil resistant nitrile rubber made from vulcanized butadiene/acrylonitrile rubber compound having a hardness of 65 to 70 IRHD

*Specification for brass ingots and castings (revised).

†Specification for brass bars, rods and sections suitable for forging.

‡Specification for free-cutting brass bars, rods and sections (third revision).

§Specification for copper (second revision).

||Specification for copper rods for electrical purposes (revised).

¶Specification for aluminium and aluminium alloy ingots and castings for general engineering purposes (second revision).

**Specification for bright bars.

<i>Metal Part or Accessory</i>	<i>For Bushing with Copper Stem</i>	<i>For Bushing with Aluminium Stem</i>
Separator (see Fig. 15, 16 and 17) and sealing washer for general purpose type M (see Fig. 22)	Oil resistant asbestos fibre jointing to Grade B/O of IS : 2712-1979*	Oil resistance asbestos fibre jointing of Grade B/O of IS : 2712-1979*
Vent plug (see Fig. 18 and 19)	For 630 A rated bushing slotted cheese head brass screw AM 8 × 15 of IS : 1366-1968† For 1 000, 2 000, 3 150 A rated bushing slotted cheese head brass screw AM 6 × 15 of IS : 1366-1968†	For 630 A rated bushing slotted cheese head brass screw AM 8 × 15 of IS : 1366-1968† For 1 000, 2 000, 3 150 A rated bushing slotted cheese head brass screw AM 6 × 15 of IS : 1366-1968†
Sealing washer for general purpose (see Fig. 20 and 21) and sealing washer Type N (see Fig. 22)	Nitrile rubber or nitrile rubber bonded cork to Type C Grade RC-70 C of IS : 4253 (Part II)-1980‡	Nitrile rubber or nitrile rubber bonded cork to Type C Grade RC-70-C of IS : 4253 (Part II)-1980‡
Connecting lug (see Fig. 23)	For 1 000 and 2 000 A rated bushings brass to Grade 3 of IS : 292-1961§ or to IS : 3488-1966 For 3 150 A rated bushing copper chromium alloy forging having the following characteristics: a) Electrical conductivity at 20°C Min 81 percent IACS (47 S m/mm²)	Aluminium alloy having the following properties: a) Electrical conductivity at 20°C Min 42 percent IACS 25 Sm/mm² b) Tensile strength, Min 300 N/mm² c) Brinell hardness 5/250, Min 100 HB

*Specification for compressed asbestos fibre jointing (second revision).

†Specification for slotted cheese head screws (dia range 1·6 to 20 mm) (first revision).

‡Specification for cork composition sheets: Part II Cork and rubber (first revision).

§Specification for brass ingots and castings (revised).

||Specification for brass bars, rods and sections suitable for forging.

<i>Metal Part or Accessory</i>	<i>For Bushing with Copper Stem</i>	<i>For Bushing with Aluminium Stem</i>
	b) Tensile strength, <i>Min</i> 370 N/mm ²	
	c) Brinell hardness 5/250 <i>Min</i> 125 HB	
	d) Chemical composition; chromium 0·3 to 1·2 percent total impurities 0·3 percent remainder copper	
Collar (<i>see</i> Fig. 24)	Brass to Grade 3 of IS : 292-1961* or to IS : 3488-1966†	Aluminium alloy to 4600 M designation of IS : 617-1975‡ or any other suitable aluminium alloy
Gasket ring (<i>see</i> Fig. 25)	PTFE or polyamide	PTFE or polyamide
Retaining ring (<i>see</i> Fig. 26)	Annealed copper wire	Annealed aluminium wire
U-link ring (<i>see</i> Fig. 27)	Phosphor bronze Grade 3 HE to IS : 7814-1975§	Phosphor bronze Grade 3 HE of IS : 7814-1975§
T-Bracket (<i>see</i> Fig. 28)	Steel to Grade Fe 410-S (St 42-S) of IS : 226-1975	Steel to Grade Fe 410-S (St 42-S) of IS : 226-1975

NOTE — Where synthetic transformer liquid is used the material for all sealing washers except type M of Fig. 22 shall be silicone rubber or any other resilient material compatible with the synthetic liquid.

*Specification for brass ingots and castings (*revised*).

†Specification for brass bars, rods and sections suitable for forging.

‡Specification for aluminium and aluminium alloy ingots and castings for general engineering purposes (*second revision*).

§Specification for phosphor bronze sheet, strip and foil.

||Specification for structural steel (standard quality) (*fifth revision*).

3. TOLERANCES

3.1 Unless specified otherwise, allowable tolerance on dimensions of any machined metal part shall be in accordance with medium class of IS : 2102-1969*.

3.2 Unless specified otherwise, allowable tolerance on dimensions of any forged or cast metal part shall be in accordance with the coarse class of IS : 2102-1969*.

4. SURFACE FINISH

4.1 The surface finish for ferrous parts shall be hot dip galvanising according to IS : 4759-1979† or zinc plating according to IS : 1573-1970‡ or cadmium plating with chromate passivation Cd 8 Cr according to IS : 1572-1968§ subject to agreement between the manufacturer and the purchaser.

4.2 The surface finish for non-ferrous parts shall be electrotinning according to IS : 1359-1977|| subject to agreement between the manufacturer and the purchaser.

5. METAL PARTS AND ACCESSORIES

5.1 **Hexagonal Nuts** — The hexagonal nuts used shall conform to IS : 1364-1967|| and IS : 3138-1966**. The threads shall be in accordance with the relevant parts of IS : 4218††.

5.2 The dimensions of metal parts and accessories for bushings with copper and aluminium stems corresponding to the various current ratings shall be in accordance with Table 1.

* Specification for allowable deviations for dimensions without specified tolerances (*first revision*).

† Specification for hot-dip zinc coating on structural steel and other allied products (*first revision*).

‡ Specification for electroplated coatings of cadmium on iron and steel (*first revision*).

§ Specification for electroplated coatings of tin. (*second revision*).

|| Specification for precision and semi-precision hexagon bolts, screws, nuts and lock nuts (diameter range 6 to 39 mm) (*first revision*).

** Specification for hexagonal bolts and nuts (M 42 to M 150).

†† Specification for ISO metric screw threads.

TABLE 1 DIMENSIONS OF METAL PARTS

(Clause 5.2)

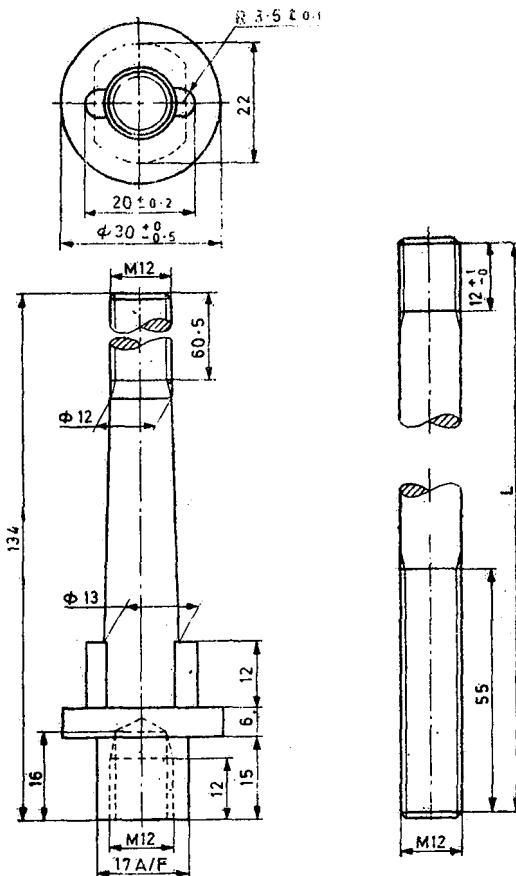
PART/ACCESSORY	METAL OF STEM	CURRENT RATING, A				
		250	630	1 000	2 000	3 150
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Stem	Aluminium	Fig. 1	Fig. 3	Fig. 3	Fig. 3	—
	Copper	Fig. 1	Fig. 2	Fig. 3	Fig. 3	Fig. 3
Cap	Aluminium	Fig. 4	Fig. 6	Fig. 6	Fig. 6	—
	Copper	Fig. 4	Fig. 5	Fig. 6	Fig. 6	Fig. 6
Upper spark-gap horn	Aluminium	Fig. 7	Fig. 9	Fig. 9	Fig. 9	—
	Copper	Fig. 7	Fig. 8	Fig. 9	Fig. 9	Fig. 9
Lower spark-gap horn	Aluminium	—	Fig. 10	Fig. 10	Fig. 10	—
	Copper	—	—	Fig. 10	Fig. 10	Fig. 10
Spark-gap horn carrier	Aluminium	—	Fig. 11	Fig. 11	Fig. 11	—
	Copper	—	—	Fig. 11	Fig. 11	Fig. 11
Sealing washer for stem	Aluminium	Fig. 12	Fig. 14	Fig. 14	Fig. 14	—
	Copper	Fig. 12	Fig. 13	Fig. 14	Fig. 14	Fig. 14
Separator	Aluminium	Fig. 15	Fig. 17	Fig. 17	Fig. 17	—
	Copper	Fig. 15	Fig. 16	Fig. 17	Fig. 17	Fig. 17
Vent plug	Aluminium	Fig. 18	Fig. 19	Fig. 19	Fig. 19	—
	Copper	—	Fig. 18	Fig. 19	Fig. 19	Fig. 19
Sealing washer for general purpose	Aluminium	Fig. 20	Fig. 22	Fig. 22	Fig. 22	—
	Copper	Fig. 20	Fig. 21	Fig. 22	Fig. 22	Fig. 22
Connecting lug	Aluminium	—	Fig. 23 A	Fig. 23 B	Fig. 23 B	—
	Copper	—	—	Fig. 23 A	Fig. 23 B	Fig. 23 B
Collar	Aluminium	—	Fig. 24	Fig. 24	Fig. 24	—
	Copper	—	—	Fig. 24	Fig. 24	Fig. 24
Gasket ring	Aluminium	—	Fig. 25 B	Fig. 25 B	Fig. 25 B	—
	Copper	—	Fig. 25 A	Fig. 25 B	Fig. 25 B	Fig. 25 B
Retaining ring	Aluminium	—	Fig. 26	Fig. 26	Fig. 26	—
	Copper	—	—	Fig. 26	Fig. 26	Fig. 26
U-Link ring	Aluminium	—	Fig. 27	Fig. 27	Fig. 27	—
	Copper	—	—	Fig. 27	Fig. 27	Fig. 27
T-Bracket	Aluminium	—	Fig. 28	Fig. 28	Fig. 28	—
	Copper	—	—	Fig. 28	Fig. 28	Fig. 28

6. ASSEMBLY

6.1 For 24 kV/250 A Rating — The assembly of the bushing is shown in Fig. 29.

6.2 For 24 kV/630 A Rating — The assembly of the bushing is shown in Fig. 30.

6.3 For 24 kV/630, 1 000, 2 000 and 3 150 A Rating — The assembly of the bushing is shown in Fig. 31.



NOTE 1 — Dimension *L* shall be adjusted so that the overall length 461 in Fig. 29 is obtained.

NOTE 2 — The corresponding porcelain part for this stem shall be 24 kV/250 A specified in Part IV/Sec 1 of this standard.

NOTE 3 — Internal connections to the stem may also be made by means of flexible cable instead of using bolt. In such a case in place threaded hole of M 12, a suitable hole required for the flexible cable may be made.

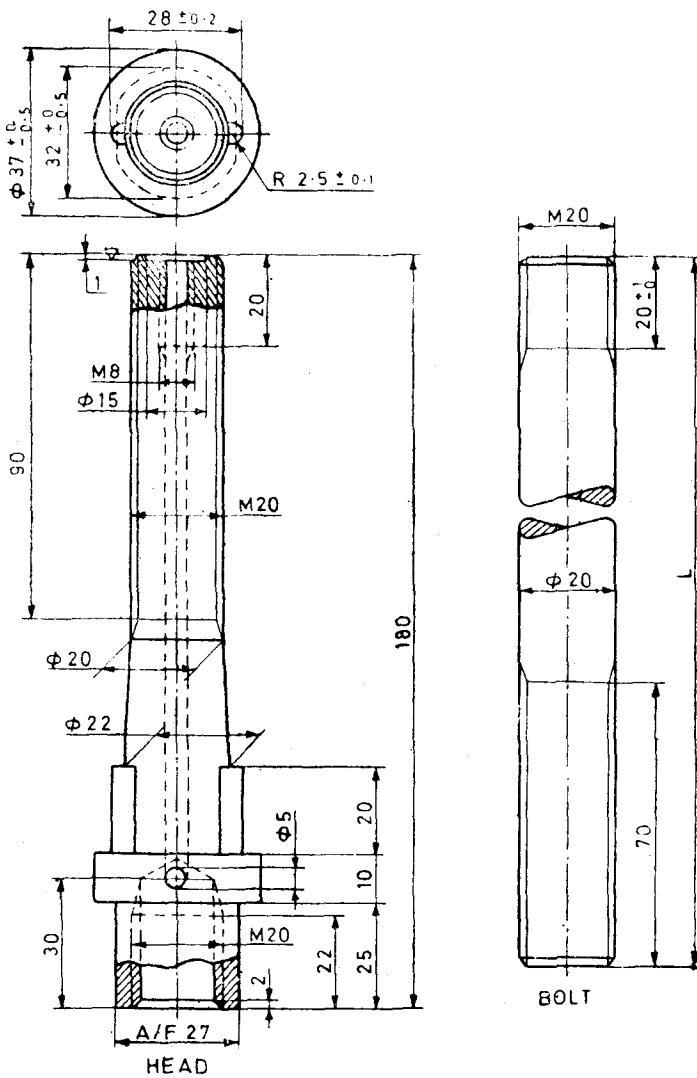
NOTE 4 — Thread ends and run outs shall be according to IS : 1368-1980* and IS : 1369-1975† respectively.

All dimensions in millimetres.

FIG. 1 STEM (FOR 24 kV/250 A RATING)

*Dimensions of ends of bolts and screws (*second revision*).

†Dimensions of screw thread run outs and undercuts (*first revision*).



NOTE 1 — L to be such that the overall length 493 in Fig. 30 is obtained.

NOTE 2 — The corresponding porcelain part for this stem shall be 24 kV/630 A specified in Part IV/Sec 1 of this standard.

NOTE 3 — Internal connections to the stem may also be made by means of flexible cable instead of using bolt. In such case instead threaded hole of M 20, a suitable hole required for the flexible cable may be made.

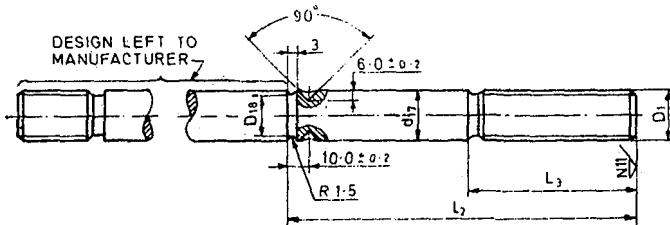
NOTE 4 — Thread ends and runout shall be according to IS : 1368-1980* and IS : 1369-1975† respectively.

All dimensions in millimetres.

FIG. 2 STEM (FOR 24 kV, 630 A RATING)

*Dimensions of ends of bolts and screws (*second revision*).

†Dimensions of screw thread run-outs and undercuts (*first revision*).



TYPE OF STEM	BUSHING RATING kV/A	CORRESPONDING RATING OF PORCELAIN PART OF SECTION 1 kV/A	D_1	D_{17}	D_{18}	L_2	L_3
Aluminium	24/630	24/1 000	M 30 × 2	30	27	206	98
Copper	24/1 000	24/1 000	M 30 × 2	30	27	206	98
Aluminium	24/1 000	24/2 000, 3 150	M 42 × 3	42	39	236	128
Copper	24/2 000	24/2 000, 3 150	M 42 × 3	42	39	236	128
Aluminium	24/2 000	24/2 000, 3 150	M 48 × 3	48	45	241	133
Copper	24/3 150	24/2 000, 3 150	M 48 × 3	48	45	241	133

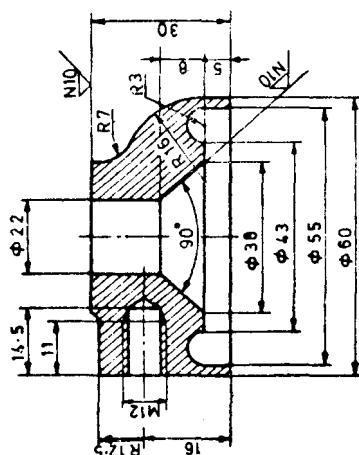
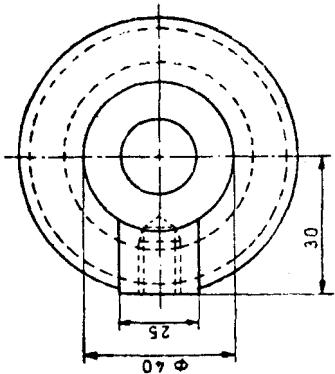
NOTE — The threaded ends shall be chamfered in accordance with IS : 1368-1980*. The thread runouts and undercuts shall be in accordance with IS : 1369-1975†.

All dimensions in millimetres.

FIG. 3 STEM (FOR 24 kV/630, 1 000, 2 000 AND 3 150 A RATING)

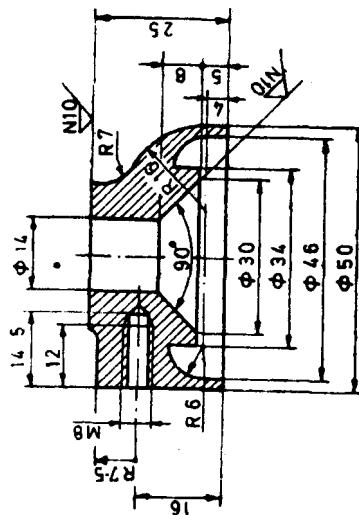
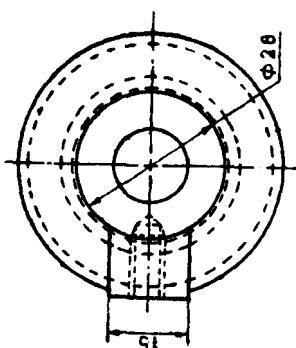
*Dimensions of ends of bolts and screws (*second revision*).

†Dimensions of screw thread run-outs and undercuts (*first revision*).



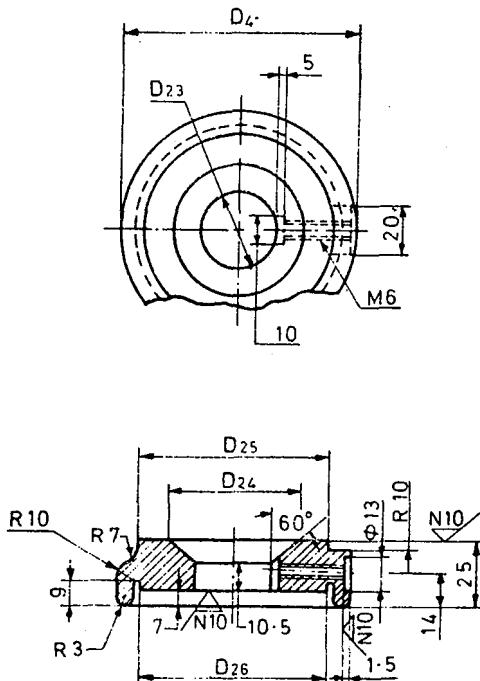
All dimensions in millimetres.

FIG. 4 CAP (FOR 24 KV/250 A RATING)



All dimensions in millimetres.

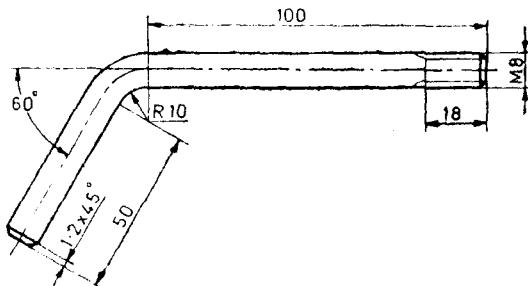
FIG. 5 CAP (FOR 24 KV/630 A RATING)



TYPE OF STEM	BUSHING RATING kV/A	D_4	D_{23}	D_{24}	D_{25}	D_{26}
Aluminium Copper	24/630 24/1 000	100	32	54	80	80
Aluminium Copper	24/1 000 24/2 000	120	44	66	100	100
Aluminium Copper	24/2 000 24/3 150	120	50	72	100	100

All dimensions in millimetres.

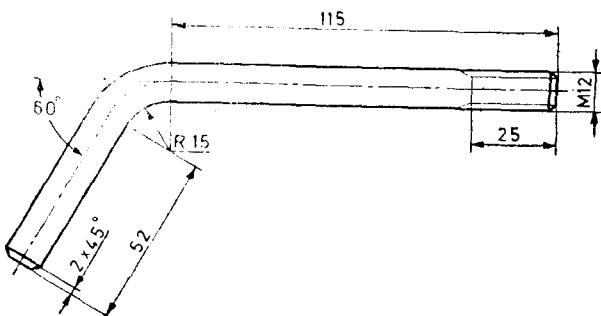
FIG. 6 CAP (FOR 24 kV/630, 1 000, 2 000 AND 3 150 A RATING)



NOTE—The threaded ends shall be chamfered in accordance with IS : 1368-1980*. The thread runouts shall be in accordance with IS : 1369-1975†.

All dimensions in millimetres.

FIG. 7 UPPER SPARK-GAP HORN (FOR 24 kV/250 A RATING)



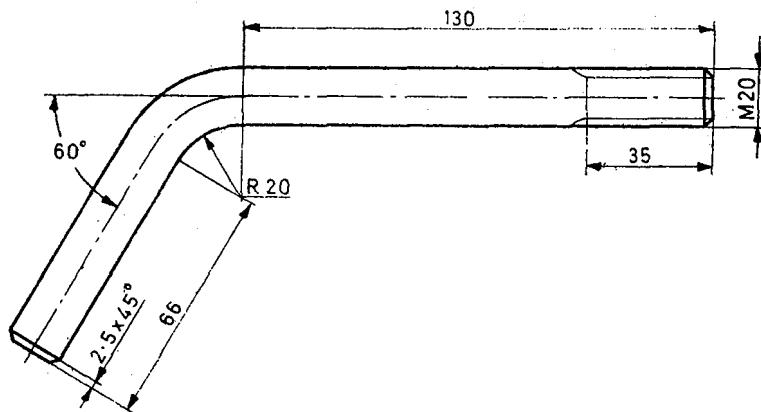
NOTE—The threaded ends shall be chamfered in accordance with IS : 1368-1980*. The thread runouts shall be in accordance with IS : 1369-1975†.

All dimensions in millimetres.

FIG. 8 UPPER SPARK-GAP HORN (FOR 24 kV/630 A RATING)

*Dimensions of ends of bolts and screws (*second revision*).

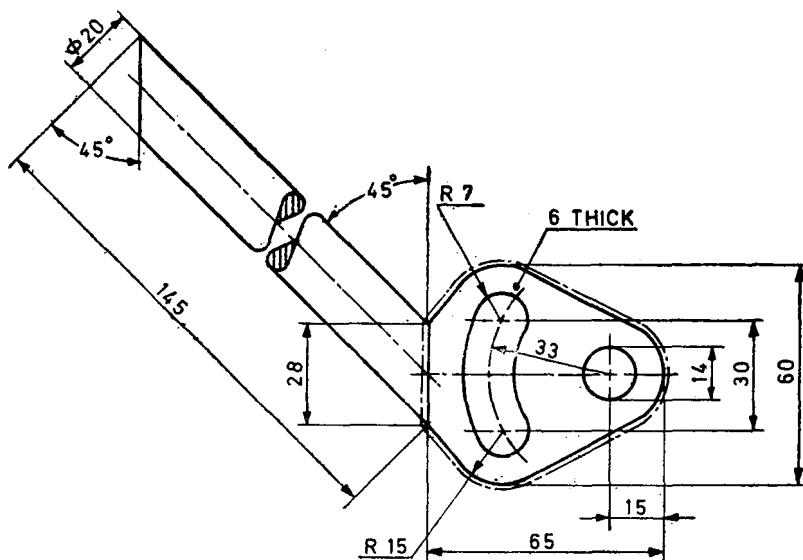
†Dimensions of screw thread run-outs and undercuts (*first revision*).



NOTE — The threaded ends shall be chamfered in accordance with IS : 1368-1980*. The thread run-out shall be in accordance with IS : 1369-1975†.

All dimensions in millimetres.

FIG. 9 UPPER SPARK-GAP HORN (FOR 24 kV/630, 1 000, 2 000 AND 3 150 A RATING)

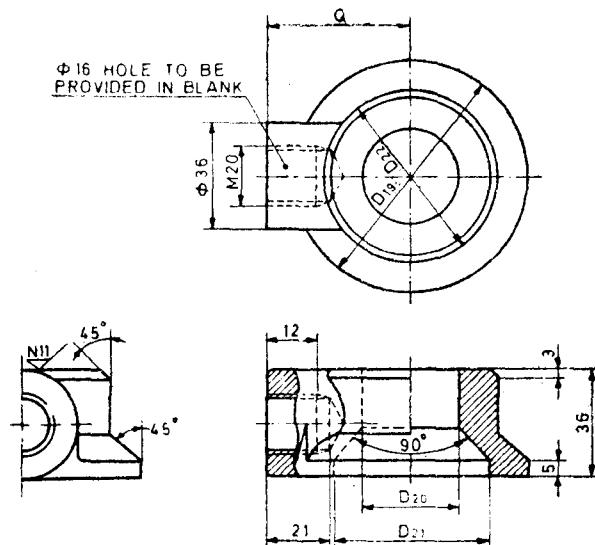


All dimensions in millimetres.

FIG. 10 LOWER SPARK-GAP HORN (FOR 24 kV 630, 1 000, 2 000 AND 3 150 A RATING)

*Dimensions of ends of bolts and screws (*second revision*).

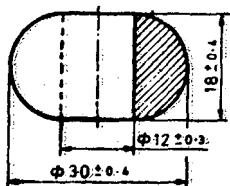
†Dimensions of screw thread run-outs and undercuts (*first revision*).



BUSHING RATING kV/A	FOR BUSHING WITH ALUMINIUM STEM					FOR BUSHING WITH COPPER STEM				
	D ₁₉	D ₂₀	D ₂₁	D ₂₂	Q	D ₁₉	D ₂₀	D ₂₁	D ₂₂	Q
24/630	80	32	54	60	50	—	—	—	—	—
24/1 000	100	44	66	80	55	80	32	54	60	50
24/2 000	100	50	72	90	60	100	44	66	80	55
24/3 150	—	—	—	—	—	100	50	72	90	60

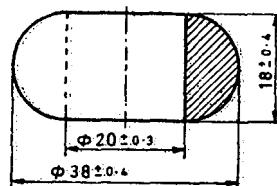
All dimensions in millimetres.

FIG. 11 SPARK-GAP HORN CARRIER (FOR 24 kV/630, 1 000, 2 000 AND 3 150 A RATING)



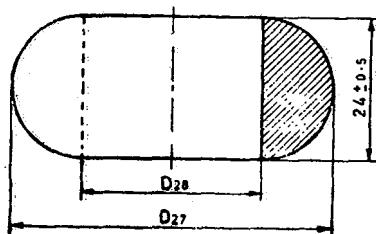
All dimensions in millimetres.

FIG. 12 SEALING WASHER FOR STEM (FOR 24 kV/250 A RATING)



All dimensions in millimetres.

FIG. 13 SEALING WASHER FOR STEM (FOR 24 kV/630 A RATING)



**BUSHING
RATING:**

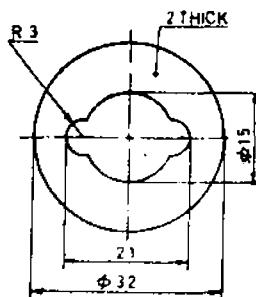
**FOR BUSHING WITH
ALUMINIUM STEM**

**FOR BUSHING WITH
COPPER STEM**

kV/A	$D_{27} \pm 0.5$	$D_{28} \pm 0.3$	$D_{27} \pm 0.5$	$D_{28} \pm 0.3$
24/630	54	30	—	—
24/1 000	66	42	54	30
24/2 000	72	48	66	42
24/3 150	—	—	72	48

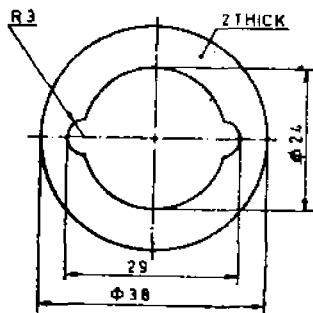
All dimensions in millimetres.

FIG. 14 SEALING WASHER FOR STEM
(FOR 24 kV/630, 1 000, 2 000 AND 3 150 A RATING)



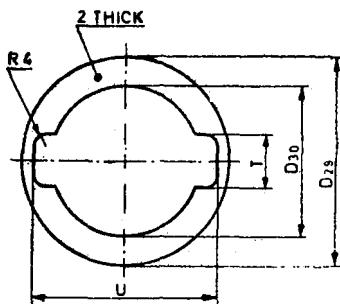
All dimensions in millimetres.

FIG. 15 SEPARATOR (FOR 24 kV/250 A RATING)



All dimensions in millimetres.

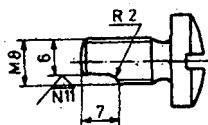
FIG. 16 SEPARATOR (FOR 24 kV/630 A RATING)



BUSHING RATING kV/A	BUSHING WITH ALUMINIUM STEM				BUSHING WITH COPPER STEM			
	D_{20}	D_{30}	T	U	D_{20}	D_{30}	T	U
24/630	56	32	12	48	—	—	—	—
24/1 000	70	50	17	62	56	32	12	48
24/2 000	70	50	17	62	70	50	17	62
24/3 150	—	—	—	—	70	50	17	62

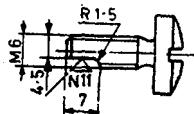
All dimensions in millimetres.

FIG. 17 SEPARATOR (FOR 24 kV/630, 1 000, 2 000 AND 3 150 A RATING)



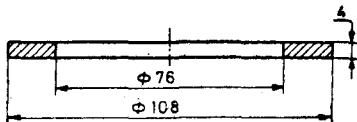
All dimensions in millimetres.

FIG. 18 VENT PLUG (FOR 24 kV/630 A RATING)



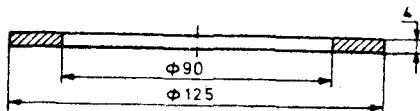
All dimensions in millimetres.

FIG. 19 VENT PLUG (FOR 24 kV/630, 1 000, 2 000 AND 3 150 A RATING)



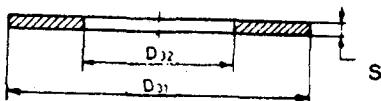
All dimensions in millimetres.

FIG. 20 SEALING WASHERS FOR GENERAL PURPOSE
(FOR 24 kV/250 A RATING)



All dimensions in millimetres.

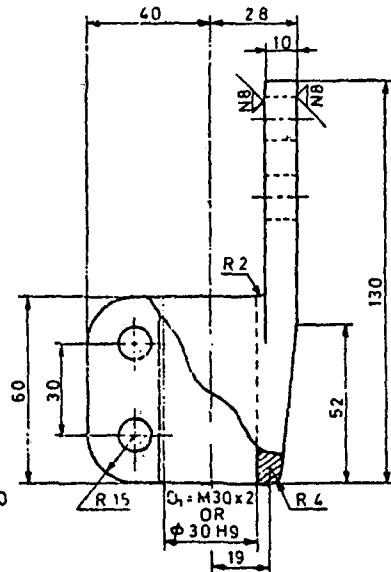
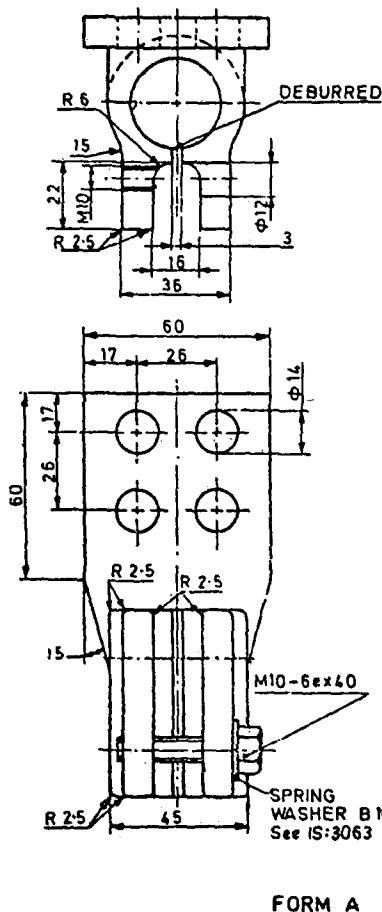
FIG. 21 SEALING WASHER FOR GENERAL PURPOSE
(FOR 24 kV/630 A RATING)



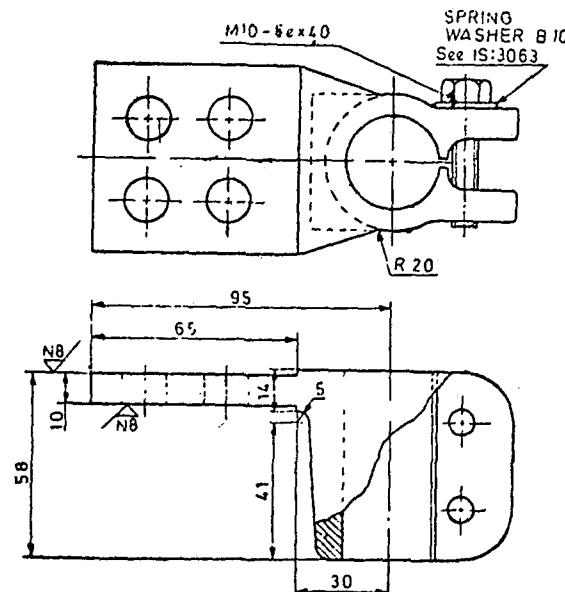
BUSHING RATING kV/A	TYPE	BUSHING WITH ALUMINIUM STEM			BUSHING WITH COPPER STEM		
		D ₃₁	D ₃₂	S	D ₃₁	D ₃₂	S
24/630	M	80	36	2	—	—	—
	N	160	110	4	—	—	—
24/1 000	M	100	50	2	80	36	2
	N	180	135	4	160	110	4
24/2 000	M	100	50	2	100	50	2
	N	180	135	4	180	135	4
24/3 150	M	—	—	—	100	50	2
	N	—	—	—	180	135	4

All dimensions in millimetres.

FIG. 22 SEALING WASHER FOR GENERAL PURPOSE
(FOR 24 kV/630, 1 000, 2 000 AND 3 150 A RATING)



FORM A



FORM B

TYPE OF STEM

BUSHING RATING
kV/A

Aluminium

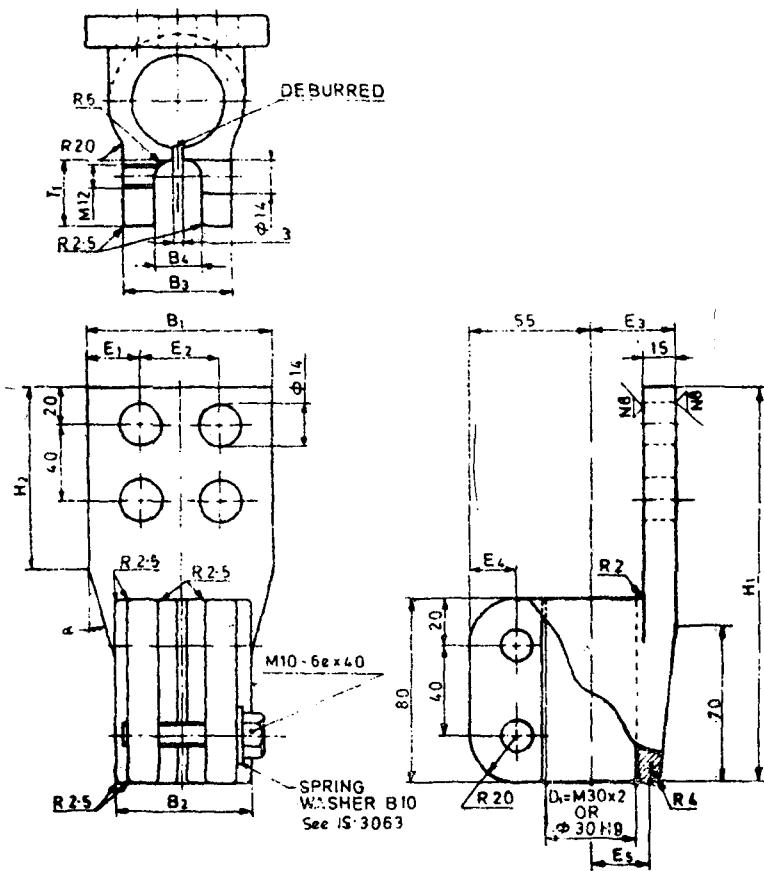
24/630

Copper

24/1000

All dimensions in millimetres.

FIG. 23A CONNECTING LUG (FOR 24 kV/630, 1000 A RATING)

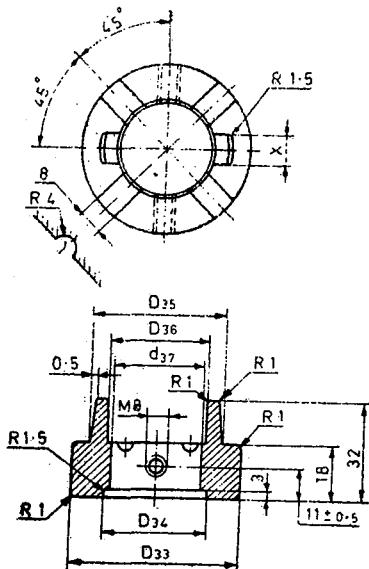


FORM A

Type of stem	Bushing Rating kV/A	D_1	B_1	B_2	B_3	B_4	E_1	E_2	E_3	E_4	E_5	H_1	H_2	H_3	H_4	T_1	A
Aluminium	24/1 000																
Copper	24/2 000	M 42 × 3	100	58	45	20	25	50	40	20	25	190	100	105	155	28	26°
Aluminium	24/2 000																
Copper	24/3 150	M 48 × 3	120	68	58	28	30	60	45	18	30	210	120	125	175	26	30°

All dimensions in millimetres.

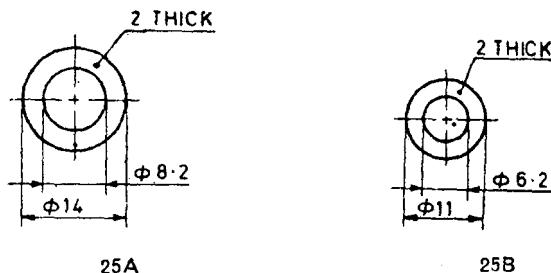
FIG. 23B CONNECTING LUG (FOR 24 kV/1 000, 2 000 AND 3 150 A RATING)



BUSHING RATING kV/A	BUSHING WITH ALUMINIUM STEM						BUSHING WITH COPPER STEM					
	D ₃₃	D ₃₄	D ₃₅	D ₃₆	D ₃₇	X	D ₃₃	D ₃₄	D ₃₅	D ₃₆	D ₃₇	X
24/630	56	34	44	33	30.7	10	—	—	—	—	—	—
24/1 000	70	46	60	50	42.7	15	56	34	44	33	30.7	10
24/2 000	70	52	60	50	48.7	15	70	46	60	50	42.7	15
24/3 150	—	—	—	—	—	—	70	52	60	50	48.7	15

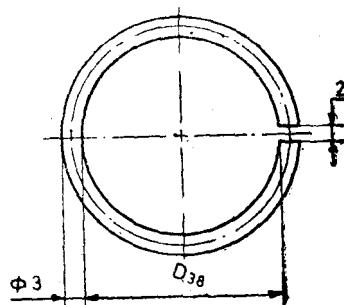
All dimensions in millimetres.

FIG. 24 COLLAR (FOR 24 kV/630, 1 000, 2 000 AND 3 150 A RATING)



All dimensions in millimetres.

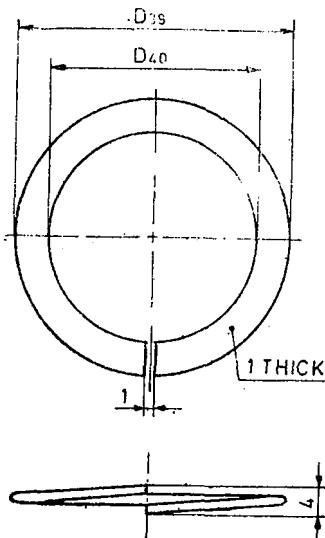
FIG. 25 GASKET RING (FOR 24 kV/630, 1 000, 2 000 AND 3 150 A RATING)



BUSHING RATING kV/A	BUSHING WITH ALUMINIUM STEM		BUSHING WITH COPPER STEM	
	D ₃₈	Stretched Length	D ₃₈	Stretched Length
24/630	27	92.4	—	—
24/1 000	39	130	27	92.4
24/2 000	45	152	39	130
24/3 150	—	—	45	152

All dimensions in millimetres.

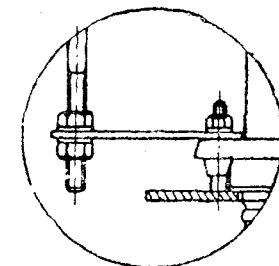
FIG. 26 RETAINING RING (FOR 24 kV/630, 1 000, 2 000 AND 3 150 A RATING)



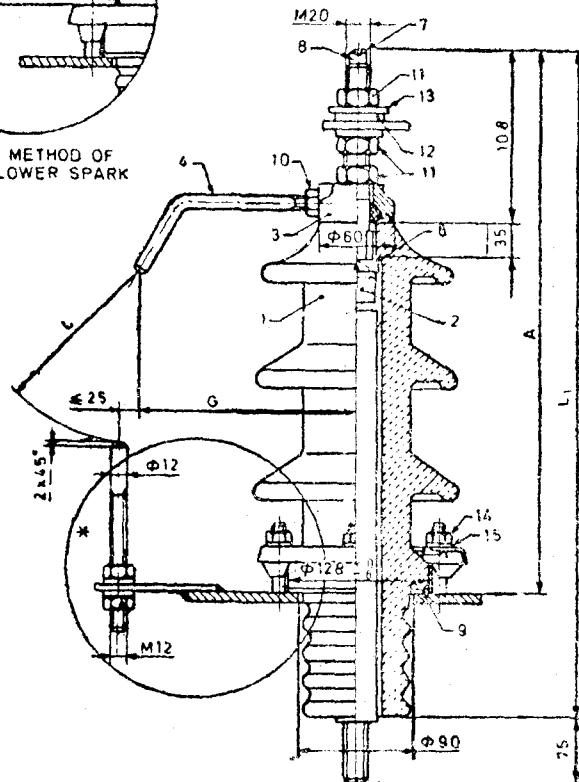
BUSHING RATING kV/A	BUSHING WITH ALUMINIUM STEM		BUSHING WITH COPPER STEM	
	D ₃₉	D ₄₀	D ₃₉	D ₄₀
24/630	76	58	—	—
24/1 000	96	70	76	58
24/2 000	96	76	96	70
24/3 150	—	—	96	76

All dimensions in millimetres.

FIG. 27 U-LINK RING (FOR 24 kV/630, 1 000, 2 000 AND
3 150 A RATING)



* ALTERNATE METHOD OF
FIXING OF LOWER SPARK
GAP HORN



BUSHING RATING kV/A 24/630	A	C	G	L ₁
	417	155	180	493

PARTS NOMENCLATURE

- | | | |
|-------------------------------|--|-------------------|
| 1. Insulator | 6. Separator | 10. Hexagonal nut |
| 2. Stem | 7. Vent plug | 11. Hexagonal nut |
| 3. Cap | 8. Gasket ring | 12. Washer |
| 4. Upper spark
gap horn | 9. Sealing washer
for general
purposes | 13. Spring washer |
| 5. Sealing washer
for stem | | 14. Hexagonal nut |
| | | 15. Washer |

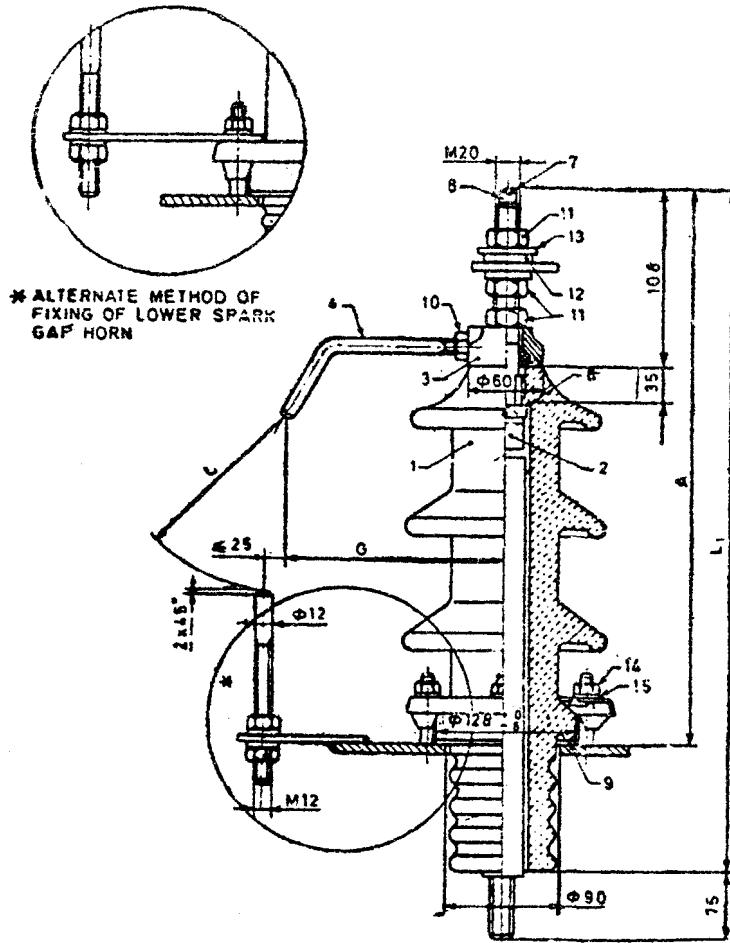
NOTE 1 — Clamping arrangement of bushing shall be according to IS:4257 (Part 1)-1981 'Dimensions for clamping arrangement for porcelain transformer bushings: Part 1 For 12 kV to 36 kV bushings (first revision).'

NOTE 2 — Alternate arrangement for fixing of lower spark gap horn may be used.

All dimensions in millimetres.

FIG. 30 BUSHING ASSEMBLY WITH COPPER STEM
(FOR 24 kV/630 A RATING)

(Page 30, Fig. 30) — Substitute the following for the existing figure:



BUSHING RATING
kV/A
24/630

A	C	G	L ₁
417	155	180	493

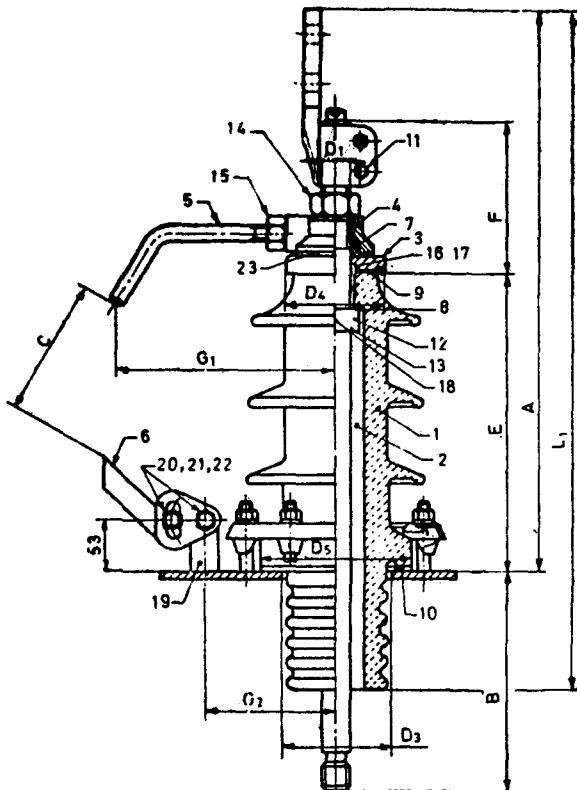
PARTS NOMENCLATURE

- | | | |
|-------------------------------|--|-------------------|
| 1. Insulator | 6. Separator | 10. Hexagonal nut |
| 2. Stem | 7. Vent plug | 11. Hexagonal nut |
| 3. Cap | 8. Gasket ring | 12. Washer |
| 4. Upper spark
gap horn | 9. Sealing washer
for general
purposes | 13. Spring washer |
| 5. Sealing washer
for stem | | 14. Hexagonal nut |
| | | 15. Washer |

NOTE 1 — Clamping arrangement of bushing shall be according to IS:4257 (Part 1)-1981 'Dimensions for clamping arrangement for porcelain transformer bushings: Part 1 For 12 kV to 36 kV bushings (first revision).'

NOTE 2 — Alternate arrangement for fixing of lower spark gap horn may be used.
All dimensions in millimetres.

FIG. 30 BUSHING ASSEMBLY WITH COPPER STEM
(FOR 24 kV/630 A RATING)



PARTS NOMENCLATURE

1. Insulator	9. Sealing washer for general purposes Type M	16. Vent plug												
2. Stem	10. Sealing washer for general purposes Type N	17. Gasket ring												
3. Cap	11. Connecting lug	18. Grub screw												
4. Spark-gap horn carrier	12. Collar	19. T-bracket												
5. Upper spark gap horn	13. Retaining ring	20. Hexagonal screw												
6. Lower spark gap horn	14. Hexagonal nut	21. Hexagonal nut												
7. Sealing washer for stem	15. Hexagonal nut	22. Spring washer												
8. Separator		23. U-link ring												
TYPE OF STEM	BUSHING RATING kV/A	A	B	C	D₁	D₂	D₃	D₄	D₅	E	F	G₁	G₂	L₁
Aluminium	24/630	530	168	155	M 30×2	110	100	163	314	148	225	138	626	
Copper	24/1 000													
Aluminium	24/1 000	605	168	155	M 42×3	135	120	183	314	178	230	148	701	
Copper	24/2 000													
Aluminium	24/2 000	635	168	155	M 48×3	135	120	183	314	183	235	148	731	
Copper	24/3 150													

NOTE 1 — Clamping arrangement of bushings shall be according to IS : 4257 (Part I)-1981*

NOTE 2 — Alternate arrangement for fixing of lower spark gap horn may be used.

All dimensions in millimetres.

FIG. 31 BUSHING ASSEMBLY (FOR 24 kV/630, 1 000, 2 000 AND 3 150 A RATING)

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ibir Bhawan, 1st Floor, Ropar Road, NALAGARH 174101	2 14 51
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